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Waste Reduction Assistance Program (WRAP) On-Site Consultation Audit Report: Photofinishing Shop

Alaska Health Project, Anchorage

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16. Abstract (Limit: 200 words)

This document reports on a study of one Alaskan photofinishing shop. The study made numerous recommendations for the reduction of hazardous waste for this shop and for the photofinishing industry in general, including advice on fix recycling, silver recovery, training, and inventory control.

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Alaska Health Project

WASTE REDUCTION ASSISTANCE PROGRAM (WRAP)

ON-SITE CONSULTATION AUDIT REPORT:

PHOTOFINISHING SHOP

ALASKA HEALTH PROJECT
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READERS NOTE:

The information contained herein is intended to be general guidance for the facility described in this report and the industry as a whole. It is the product of approximately 6 to 8 hours of on-site consultation. The focus of the report is waste management and waste reduction, not regulatory compliance. Regulatory issues mentioned herein are discussed only insofar as they impinge on management issues related to hazardous waste management and waste reduction, and are not part of a comprehensive discussion about all pertinent regulation requirements. Waste determinations were made from available data, no on-site sampling took place. Managers interested in specific information on hazardous waste regulations should contact the nearest EPA or Department of Environmental Conservation office. Waste reduction measures are described briefly and should be further evaluated and balanced against unique conditions of each specific business.

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I. Introduction

A. The Waste Reduction Assistance Program (WRAP).

In 1986, the United States Environmental Protection Agency (US EPA) awarded a RCRA 8001 grant to the Alaska Health Project, a private non-profit organization located in Anchorage, Alaska. The grant was awarded to develop and deliver a pilot project to assist Alaska's Small Quantity Generators (SQGs) in complying with new Small Quantity Generator regulations. The project, the Waste Reduction Assistance Program (WRAP) has two principal goals:

1. To conduct outreach and education activities to support EPA's Small Business Initiative to achieve Small Quantity Generator compliance with new hazardous waste regulations.

2. To conduct on-site audits to investigate hazardous waste management practices and processes for specific SQG's categories.

WRAP on-site consultation audits are conducted with the understanding that the identity of selected SQGs remain confidential and that all audit reports contain no specific facility identifiers. Audit results and recommendations are intended to be widely applicable to other SQGs in Alaska. Audit reports are available to interested parties upon request.

This report is the product of conducting an environmental audit of an Alaskan photofinishing shop. The report goals are to:

1) Analyze a typical photofinishing shop in Alaska and publish the findings in a report.

2) Provide a format, by making available this report, to other photofinishing shops and businesses to conduct their own environmental audit.

3) Identify the hazardous wastes produced in the photofinishing shops and the processes by which they are generated.

4) Make recommendations, if appropriate, to reduce the amount of hazardous wastes generated.

5) Identify common waste management practices and advise on possible better methods to store and ship hazardous wastes.

6) Analyze the cost benefits of the waste reduction methods recommended in this report.

All recommendations, information, and cost data are subject to change. They will not reflect future market conditions, regulatory climate, and changes in shop processes. This report offers only general guidance to other small quantity generators and all the information provided should be balanced against the unique conditions of each specific business.

B. Audit Methods.

The audit team consisted of an environmental scientist and an environmental health specialist. The audit comprised two main steps:

1) Interview and data collection.
2) Shop walkthrough.

Step one consisted of an interview with the shop manager. The interview was designed to collect the following information:

1) General shop information (size, operation, etc.).

2) Shop processes.

3) Material safety data sheets.

4) Current waste management practices.

The interview was also designed to provide the shop manager with a detailed description of the audit process.

In step two, the audit team and the shop manager conducted a visual inspection of the shop operations and processes. The audit team identified the processes generating potential hazardous wastes and investigated current waste management practices.

The approximately 6 hours of on-site consultation included no environmental sampling or industrial hygiene monitoring. All the information provided in this report is based on the interview, the walkthrough, and a review of the current and available literature. Hazardous waste determinations were based upon a review of material safety and data sheets, any existing laboratory reports, and EPA literature. Waste volume figures are based upon estimates made by the generator and the audit team during the shop walkthrough.

planned. Drums of spent chemicals will no longer be carried on a dolly from their point of generation to the warehouse but will instead be piped.

III. Waste Generation

A. Waste Generation by Process.

The wastes produced by each photofinishing process are described in this section. Table III.1 shows the type and quantity of the wastes generated by each photofinishing operation. The type and quantity of the wastes generated were determined from an interview with the business owner, available Material Safety and Data Sheets (MSDS), and literature. No sampling was performed.

Table III.1
Types of Potential Hazardous Wastes Generated

Process	Waste Type	Quantity
Black & White Negatives Developing	Developer	1.7 gallons/month
	Fixer	1.5 gallons/month
	Orbit bath	1.5 gallons/month
Black & White Picture Printing	Developer	10 gallons/month
	Stop bath	5 gallons/month
	Fixer	10 gallons/month
Color Negatives Developing	Developer	7.5 gallons/month
	Bleach	None (Regenerated)
	Fix	9.7 gallons/month
	Stabilizer	4.3 gallons/month
Color Pictures Printing	Developer	28 gallons/month
	Bleach-Fix	34.4 gallons/month
Slides Developing	Developer #1	2 gallons/month
	Reversal bath	1 gallon/month
	Color Developer	0.6 gallon/month
	Conditioner	1 gallon/month
	Bleach	0.2 gallon/month
	Fix	1 gallon/month
	Stabilizer	1 gallon/month
Custom Work	Developer	20 gallons/month
	Bleach-Fix	20 gallons/month

Black & White Negatives Developing

The developing of black & white negatives makes use of a developer, a fixer, and an orbit bath. Figure III.1 shows a flow diagram of the film developing process. Negative developing also generates scraps. The scraps are soaked in a spent fixer bath for 1-12 hours. The soaking removes the silver from the nega-

tives. The fixer is then treated to recover its silver content. The stripped negatives are dried and disposed of in the trash.

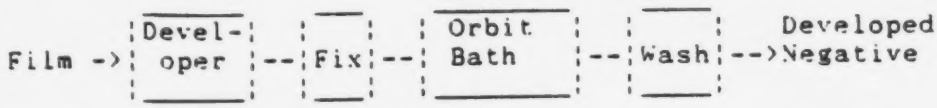

Figure III.1 - Black & White Negative Developing Steps

Black & White Printing

This business utilizes a developer, a stop-bath, and a fixer to make black & white prints. All of these chemicals are disposed of in the drain. Again, the silver in the fixer is recovered prior to disposing of the fixer. Figure III.2 shows a flow diagram for the Black & White Picture printing process.

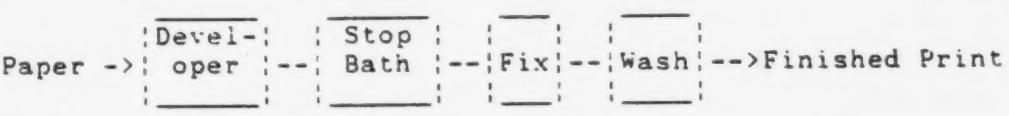

Figure III.2 - Black & White Printing Steps

Color Negative Developing (C41)

The developing of negatives involves the use of a developer, a bleach, a fixer, and a stabilizer. Used developer is disposed of in the drain. The bleach is replenished periodically. In addition to being replenished the bleach is regenerated whenever a replenisher container is used. Bleach regeneration takes place in the plant's storeroom. No bleach from this process is wasted at all. Bleach losses are due to carry over by the negatives into the wash. The fixer is processed to recover its silver content. The stabilizer is flushed down the drain. This process also generates negatives scraps. The scraps are treated in the same manner as the Black & White negative scraps. Figure III.3 shows a flow diagram of the Color Negative Developing process.

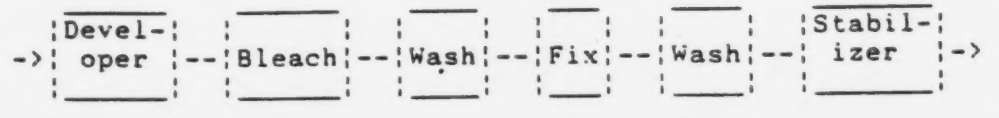

Figure III.3 - Color Negative Developing Steps (C41)

Color Printing (EP2)

The printing of the negative onto photographic paper requires the use of a developer and a bleach-fix. The bleach-fix is processed to recover its silver contents. The developer is

disposed of in the drain. The printing process also generates some waste paper which is disposed of in the trash. Figure III.4 shows a flow diagram of the color printing process.

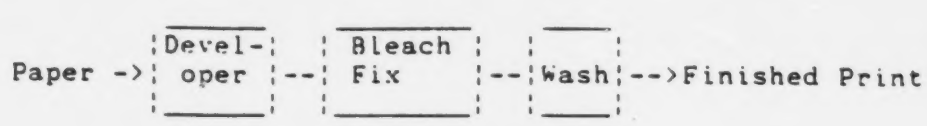

Figure III.4 - Color Printing Steps (EP2)

Slides Developing (C41)

All the chemicals utilized in slide developing are disposed of the drain with the exception of the fixer. The fixer is treated to recover its silver content.

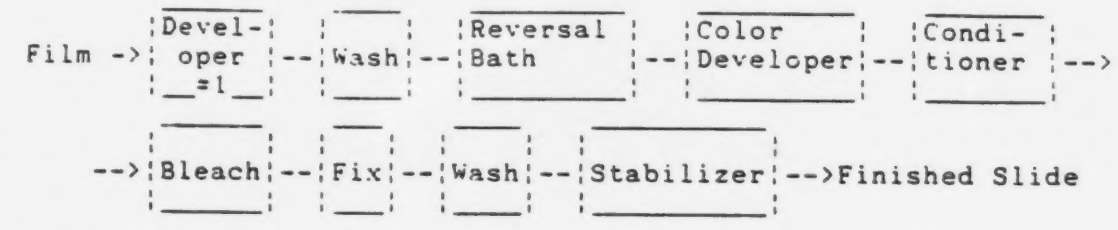

Figure III.5 - Negative Developing Processing Steps (C41)

Custom Work (EP2)

Custom Work makes use of a developer, a bleach, and a fixer. The bleach and the developer are disposed of in the sewer and the the fixer is treated to recover its silver content. Figure III.6 illustrate the custom work process.

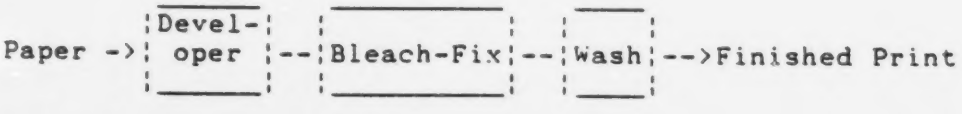

Figure III.6 - Custom Work Processing Steps (EP2)

In addition to the various developers and fixers described above, the business consumes a large amount of water. The average water consumption for the summer months is around 100,000 gallons per month. During the winter months consumption is less. The business volume is much larger during the summer.

B. Regulated Wastes

Table III.2 gives a classification of the wastes produced by the printing shop. The photographic baths in accordance with Lo-

cal, State, and Federal regulations, can be disposed of in the sewer if their hazardous materials concentrations do not exceed certain limits. The baths without silver recovery may exceed the silver concentration limit set by the Anchorage Municipal Code, Title 26.50. The municipal code sets a concentration limit of 0.02 mg of silver per liter of wastewater. Other metals and physical characteristics of the wastewater are also regulated. The municipal limitations, however, apply to the total discharge from a user, exclusive of sanitary wastewater. To insure compliance with the municipal ordinance, the photofinishing shop's wastewater should be periodically tested for heavy metals and other regulated parameters.

Table III.2
Classification of the Photofinisher's Wastes

Waste Type	Chemical Name	Classification /Shipping Name
Photographic Wastes	Various photographic wastes, non-corrosive, without heavy metals	Not Regulated
Photographic Wastes	Photographic wastes containing heavy metals	Hazardous Wastes /Hazardous Waste Solution containing Cadmium, Chromium, Lead, and Cyanide

The properties of the wastes listed in Table III.2 were established from the information furnished by the MSDS for the chemicals used at the photofinishing shop. The property of the wastes will of course vary with the chemicals used. Consult Appendix C for a more general description of the wastes produced by the printing industry. Many of these wastes may be generated by the photofinishing industry.

IV. Waste Management

A. Waste Storage

A small quantity generator may not store hazardous wastes in quantities greater than 13,200 pounds for longer than 180 days. The waste may be stored for 270 days if it has to be transported over 200 miles to a licensed hazardous waste facility. This case applies to Alaska, which has no approved hazardous waste disposal facility. Generators of less than 220 pounds per month of hazardous wastes are subject to the Small Quantity Generator Regulations if they store more than 2,200 pounds of hazardous wastes.

Hazardous wastes containers should be clearly labeled "hazardous wastes". The containers should also be marked with the date the collection of the wastes began. The containers should be kept in good condition, closed, and inspected once per week. The wastes, if ignitable or reactive, should be placed as far as possible from the storage's property line. The wastes may be treated on-site without a permit if:

a) They are treated within 180 days (in Alaska, 270 days).

b) The containers conform to the regulation described in the above paragraph.

c) Steps are taken to prepare for and prevent accidents as described in the Small Quantity Generator Regulations.

Precautions should be taken to prevent accidents involving the hazardous materials stored on site. The regulations for the storage of hazardous materials and wastes were written to prevent accidental spills, fires, explosions, and release to the environment. The operator of a site should develop a contingency plan to deal with an accident involving the hazardous wastes being stored.

B. Waste Disposal Methods

Photographic Wastes

The photographic wastes can be disposed of in the sewer if they satisfy the limitations set by the Local, State, and Federal regulations. It is important to stress that the nature of photographic wastes can greatly vary with the type of photographic chemicals used. There is a large variety of developers and fixers available with different chemical compositions. Photographic wastes can easily contain sufficient heavy metals concentrations to prohibit their discharge to the sewer system.

The shop generates approximately 45 gallons per week of a

bleach-fix and fix mixture with an average silver content of 22.7 grams of silver/gallon. This business feels that it attains a silver recovery efficiency of 99.7%. This high efficiency is the manufacturer's advertised maximum efficiency for the recovery system used. This business takes great care in monitoring its recovery system and feels that it can attain maximum recovery efficiency on a consistent basis. The silver remaining after treatment of the bleach-fix and fix mixture can be calculated as follows:

$$\frac{22.7 \text{ grams Ag}}{\text{Gallon}} \times \frac{45 \text{ Gallons}}{\text{Week}} \times \frac{4.3 \text{ Weeks}}{\text{Month}} \times 0.003 = \frac{13.2 \text{ grams Ag}}{\text{Month}}$$

Where

Ag = Silver

The shop water consumption is approximately 100,000 gallons per month. For the purpose of this calculation it is assumed that all of the water consumed is disposed of as wastewater. The silver content of the wastewater is obtained as follows:

$$\frac{13.2 \text{ grams Ag}}{\text{Month}} \times \frac{1000 \text{ mg}}{\text{gm}} \times \frac{\text{Gallon}}{3.785 \text{ L}} \times \frac{\text{Month}}{100{,}000 \text{ G}} = \frac{0.03 \text{ mg Ag}}{\text{Liter}}$$

Where

Ag = Silver
G = Gallons
gm = Grams
L = Liters
mg = Milligrams

The wastewater silver content is above the 0.02 mg/l limit set by the Anchorage Municipal Code. The bleach-fix/fix mixture, therefore, cannot be disposed of in the sewer. The bleach-fix/fix mixture should be tested to insure that it is not classified as a hazardous waste. If it is found to be a hazardous waste it should be disposed of as such. If it is not found to be a hazardous waste, this business should contact the municipal landfill to determine if the waste, once solidified, will be accepted for disposal as solid waste.

In the event that the waste is found to be hazardous, this business would be classified as a small quantity generator. The 45 gallons/week, or 194 gallons/month, weigh approximately 1600 pounds and, therefore, would subject the shop to the Small Quantity Generator Regulations.

Generally, there are three acceptable disposal methods for hazardous wastes:

1) Disposal in a licensed hazardous waste landfill.

2) Disposal in a authorized high-temperature incinerator.

3) Disposal to an authorized hazardous waste recycler.

None of these facilities are available in Alaska and all wastes must be transported to a disposal site approved by the EPA. The wastes must be shipped in containers and by haulers as prescribed by DOT. A hazardous waste hauler should be able to offer assistance in assuring adequate packaging. The packaging requirements are described in the DOT regulations (49 CFR Part 172).

C. Costs

The cost of disposing hazardous wastes can vary with the following factors:

1) Quantity and nature of the wastes.

2) Transportation distance.

3) Variations in prices charged by the haulers and disposal facilities for the transportation and disposal of the hazardous wastes.

It may be advantageous to contact other generators of hazardous wastes to coordinate shipments and realize savings through bulk shipments. Waste determination fees may be eliminated if future waste streams remain constant.

In Alaska, there are no EPA approved hazardous wastes management facilities. All hazardous wastes, as defined by RCRA, must be shipped out-of-state to an approved facility. The cost of shipping the hazardous waste increases the disposal costs considerably.

Comprehensive disposal costs for a 55-gallon drum of hazardous waste generated in Alaska can cost up to $1,390.00 (Glean Incorporated). See Table IV.1 for a cost breakdown. This is a very generalized estimate which assumes incineration as the disposal method. If the waste is disposed of in a landfill or by recycling, costs may be reduced. Also, as noted previously the cost can vary depending upon the hauler and the disposal facility.

The high disposal cost of hazardous wastes should be taken into consideration when purchasing raw materials and planning expenditures. Production processes and methods should also be analyzed to identify means of minimizing the generation of hazardous wastes and thereby disposal costs.

Table IV.1
Hazardous Waste Disposal Cost Estimate for One
55-Gallon Drum Generated in Alaska

Waste Determination (In state lab analysis)	$ 175.00
Transportation	$ 310.00
Disposal Site Profile (On site lab analysis)	$ 200.00
Waste Acceptance	$ 125.00
Incineration	$ 580.00
Total Cost	$1,390.00

V. Waste Generation Reduction Alternatives.

A. Incentives

A number of incentives exist to promote hazardous wastes reduction in the private sector. Waste reduction incentives include:

1) High Disposal Costs: Land Disposal restrictions outlined in the Hazardous and Solid Waste Amendments of 1984 limit the number of untreated wastes that can be disposed of on land, and impose stricter standards on surface impoundments and underground tanks. In addition, hazardous wastes management facilities are scarce in the United States. These and other factors contribute to the high disposal costs of hazardous wastes.

2) Financial Liability: Generators of hazardous wastes incur liability of their wastes from the time they are produced to the time of their ultimate disposal. This is known as the cradle to grave concept. The liability includes potential improper handling by the wastes transporter and disposal facility. Generators also are liable for any future sudden releases of disposed wastes. The generator may be required to pay for the entire clean-up of a spill and/or waste site. Generating a smaller quantity of hazardous wastes translates into decreased financial liability.

3) Public Relations: Employing waste reduction techniques in a business can improve the public perception of the business. A favorable perception can result in better community relations and possible financial gains.

B. Waste Reduction Categories

Waste reduction techniques can be grouped into the following broad categories:

1) Process Technologies: This involves the use of technology to reduce process wastes. Silver recovery is a waste reduction technology used successfully by the photofinishing industry.

2) Plant Operations: This category involves alterations in plant operations to decrease hazardous wastes generation. Better inventory control and efficient use of raw materials are examples of plant operations changes that can be made to minimize hazardous wastes production. The use of a squeegee between photographic

baths, to wipe excess liquid from the photographic material being developed, is an example of waste reduction through plant operation changes. Wiping excess chemicals from the photographic material prolongs the life of the bath by decreasing contamination through carry-over from one bath to another.

3) Plant Input Changes: Another way to reduce hazardous wastes generation is to utilize raw materials that will not become hazardous wastes during the production process.

4) In-Process Recycling: This process recycles potential hazardous wastes by channeling them back into the production process. Replenishing and regenerating bleach as an alternative to disposal is an example of recycling.

C. Potential Waste Reductions in the Photofinishing Industry

Most photofinishing processes can generate hazardous wastes. The waste reduction techniques described in the previous section can be applied to the photofinishing industry. The photofinishing shop in this audit could benefit from these techniques as follows:

Process Technologies

Silver recovery is a widely used process technology. This technology is relatively simple to operate and requires a minimum amount of maintenance. Silver recovery is usually a profitable operation. In addition to the profits it generates, it also considerably reduces the hazardous properties of the plant's waste stream. Consult section 3 of this chapter for a detailed process review and economic feasibility study.

Use of non-absorbent "twin-checks" to identify negatives is another example of process technology successfully used by this shop. The non-absorbent labels help decrease the amount of chemicals carried form one bath to another and therefore increase the life of the baths.

Counter-current washing is a process technology that may be beneficial to this shop. Counter-current washing describes the use of water, from previous washes, to first contact the film being developed. Fresh water contacts the film at the final rinse stage and is then used again for the first film rinse. This technology reduces the amount of water utilized. This shop's developing machines make use of a limited counter-current washing process. It may not be advantageous for this shop to invest in a more sophisticated counter-current system because this shop's water supply is cheap and plentiful. In situations,

however, where water is scarce and expensive, counter-current technology may offer economic and environmental advantages.

Plant Operations Changes & Plant Input Changes

The photographic chemicals should be chosen for their performance and their chemical properties. If the photographic chemicals contain, for example, heavy metals or trichloroethylene, they are likely to become hazardous wastes. The cost of waste disposal should be taken into consideration when comparing purchasing costs.

This shop also makes use of floating lids on bleach and developer containers. The floating lids help retard oxic through contact with air. It was found that in general this is run in an efficient fashion. The chemicals are cl monitored and care is taken to conserve raw materials. A t inventory control may provide more insights to the shop owne the shop maintenance employee as to where additional economi raw materials may be made.

In-Process Recycling

Reduction in photoprocessing chemicals use should al: studied. Most photoprocessing chemicals can be regenerated by making use of replenishers, thereby, decreasing the amounts of wastes produced. The low photographic wastes figures, indicated for the photofinisher in this audit, are due to an extensive use of replenishers/regenerators.

At present this shop replenishes and regenerates its bleach. Technology has been developed to recycle most developers and fixers. This shop may benefit from such technology. This photofinisher used to recycle their bleach-fix until the chemical necessary for regeneration became unavailable.

Another recycling technology that may benefit the shop, is the recycling of its wastewater. As described in this chapter, this shop's wastewater silver content is in violation of the Anchorage Municipal Code. A closed cycle system may enhance silver recovery and solve this shop's waste disposal problem.

D. Process Review and Economic Feasibility of Silver Recovery

This photofinisher successfully recovers 95-98 % of the silver present in the spent bleach-fix and various fixers. The silver recovery system is composed of an electrolytic plating unit and a metallic replacement unit. The Bleach-Fix and Fix are mixed together in a 50:50 ratio. The mix is tested with silver sensitive paper to approximate its silver content. The length of

the electrolytic treatment varies with the silver content of the mix. Prior approximate knowledge of the silver content of Bleach-Fix/Fix mix is necessary in order to set the treatment time correctly and to enhance the efficiency of the process. The electrolytic bath removes 90% of the silver present in the mix. The mix is then passed through a sealed drum containing steel wool. Inside the drum, the steel wool is replaced by the silver in the mix. This metallic replacement removes another 60 to 90% of the remaining silver. This photofinisher always fills the sealed drum with fixer prior to using the drum. This is done to insure an even distribution of the bleach-fix/fix mixture when the drum is on-line. The silver recovery system is estimated to remove 97% of the silver present in the mix. The 97% figure, although lower than the shop's estimated recovery efficiency, was chosen to provide the reader with a conservative economic feasibility study.

The silver recovery unit costs $8900 and requires 3 hours per week of attendance. The shop recovers on the average 32 Troy ounces of silver. This figure was obtained by estimating that the average bleach-fix/fix mix contains 0.73 Troy ounces of silver per gallon. The shop processes 45 gallons per week of the bleach-fix/fix mix and recovers on the average 97% of the silver. At an average price of $7 per Troy ounce this represents an income of $224/week. The cost of operating the unit is estimated at 3 hours/week x $15/hr or $45/week. In addition the shop pays $0.45/oz. for a smelter to process the recovered silver. The net income to the shop is $165/week. This figure was obtained with numbers reflective of the summer business. The winter volume is estimated, by the shop owner, to be around 32% of the summer volume. The income for the year is equal to $165 x 17 summer weeks + $165 x 35 winter weeks x 0.32 or $4653. This represents a pay-back period of 2 years.

The present silver recovery system does not recover enough silver to allow the shop to dispose of their bleach-fix/fix mix in the sewer. There are recovery systems available that will remove silver to levels below the present Anchorage Municipal Code. It be may advantageous for this shop, taking into account the cost of properly disposing of this potentially hazardous waste, to invest in such a system.

VI. Summary & Conclusions

The quantity of hazardous wastes generated, by the photofinisher described in this audit, was determined with information provided by the photofinisher at the time of the audit. The photofinisher may, in actuality, generate hazardous wastes in quantities other than the one described in this report. Changes in processes and chemicals will affect the amount of hazardous waste generated.

The photofinisher in this audit was found to generate between 220 pounds and 2200 pounds of hazardous wastes per month. At present, the wastes are disposed of in the sewer along with the plant's wastewater. Better silver recovery or proper storage and disposal of the hazardous wastes should be implemented to comply with the Small Quantity Generator Regulations.

In general, a photofinisher should carefully monitor the chemicals used in the various photofinishing processes and note the ingredients present in those chemicals. Periodical testing of the wastes should also be performed to identify the nature of the wastes produced.

The literature available and this audit point to the fact that there are many products and technologies available on the market today, which decrease the generation of hazardous wastes. This photofinisher already makes use of several techniques to conserve raw materials and to reclaim wastes.

To further minimize the generation of hazardous wastes, this photofinisher and other photofinishers should:

a) Explore the possibility of bleach-fix and fix recycling.

b) Consider utilizing additional silver recovery technology to possibly eliminate the generation of hazardous wastes.

c) Have the bleach-fix/fix mixture analyzed to determine if it is a hazardous waste.

d) Implement recycling of the bleach-fix/fix mixture and additional silver recovery. The shop should dispose of the bleach-fix/fix mixture as a hazardous waste if it is found to be hazardous. The bleach-fix/fix mixture may be disposed of as a solid waste if the waste is not hazardous. The municipal solid waste services should be consulted to determine a proper method, if any, to dispose of the bleach-fix/fix mixture as a solid waste.

c) Provide training programs to workers to insure efficient use of raw materials.

d) Develop an inventory control to monitor more closely the quantity of raw materials used.

In general, conducting periodic environmental audits can prove to be an excellent tool to decrease the hazardous wastes generated and to improve overall plant efficiency.

Appendix A

Synopsis of the Small Quantity Generators Regulations

Facilities producing between 220 and 2200 pounds of hazardous wastes per month are subject to the Small Quantiy Generator regulations. These regulations will require waste producing facility to:

1) Identify the hazardous wastes produced.

2) Obtain an EPA identification number.

3) Ship hazardous wastes for treatment, storage, or disposal in EPA approved facilities. The shipment will have to meet the requirements set by the Federal Department of Transportation for hazardous wastes. In addition the shipment will have to be accompanied by a manifest containing the generator's name and address, the shippers name, and the name and address of the receiving facility.

4) The hazardous wastes should be offered, at least every 180 days, to shippers and disposal facilities with an EPA identification number. In Alaska, because there are no EPA certified hazardous waste disposal sites within 200 miles, the wastes can be stored for 270 days. The maximum weight of the wastes being stored, however, cannot exceed 13,200 pounds.

5) Finally, the waste generator should keep a copy of the shipping manifest for three years.

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

SEP 23 1986

RECEIVED
OCT 09 1986
WASTE MANAGEMENT BRANCH

REPLY TO ATTN OF: M/S 530

David Wigglesworth
Alaska Health Project
417 W Eighth Avenue
Anchorage, Alaska 99501

Dear Mr. Wigglesworth:

This is in reply to your question regarding information required by the Alaska Health Project's small quantity generator study. The purpose of this project is to study general waste management procedures and processes for specific small quantity generator categories. We hope to identify common current waste practices that can be better managed, and/or methods where waste generation can be minimized.

Because we wish the study results and recomendations to be as widely applicable to other generators as possible, we would like to obtain information which characterizes the representative generators you are studying. We do not feel any facility-specific identifiers will be necessary, but we would like any information on the facility type, process, size of operation, and/or any other information which would have bearing on the usefulness or extrapolation of the data to other generators, both in and outside of Alaska.

If you have further questions, please feel free to contact me.

Sincerely,

Joan Cabreza
RCRA Program Development

Printing and Allied Industries

APPENDIX C

Your firm is included in Printing and Allied Industries if it is involved in:

Preparation

- Typesetting
- Lithography
- Letterpress
- Gravure
- Engraving (stationery)
- Photoengraving

Printing

- Heatset Lithography
- Non Heatset Lithography
  - Thermography
  - Business Form Printing
  - Sheetfed Lithography
- Letterpress Printing (including flexography)
- Gravure Printing
- Screen Press Printing

Finishing Operations

- Looseleaf Binder Manufacturers
- Trade Binding Operations
- Book Binding Operations
- In House Binding Operations
- Magazine and Catalog Binding Operations

Not all printing or allied industry operations produce hazardous waste. However, if you use ignitable (flash point ≤ 140°F) solvents, strong acid/alkaline solutions, paint or ink containing solvents or heavy metals (in concentrations greater than the EP Toxicity levels) or both, the wastes you generate may be hazardous. If so, you may be subject to new Resource Conservation and Recovery Act (RCRA) provisions concerning the generation and transportation of hazardous wastes. Table 1 lists typical processes/operations in the printing and allied industries which could produce hazardous wastes.

HAZARDOUS WASTES FROM PRINTING AND ALLIED INDUSTRIES

Printing generates waste ink and ink sludges that may contain solvents and sometimes heavy metals. The composition of inks used in printing and allied industries varies greatly depending on whether an ink is to be used for lithography, letterpress, gravure flexography, or screen printing. Oil-based or paste inks are generally composed of colorant or pigments (carbon black, inorganic, and organic), varnish (drying oils, alkyd, resin-phenolic, resin-ester), drier (cobalt, manganese, or zirconium fatty acid compounds), sometimes an extender, solvents and modifiers (waxes, petroleum solvents, and magnesol). Fluid inks contain a vehicle comprised of resin and solvent or oil, and additives such as waxes, drier and wetting agents. While not all waste inks and ink sludges will be hazardous, those containing solvents or heavy metals generally are.

Photographic processes are used in all of the major printing operations for image conversion and plate-making. Photographic wastes, therefore, comprise a large portion of the hazardous waste generated in these industries. Photographic processing solutions, developers, hardeners, plating chemicals, fountain solutions, or fixing baths that are sent to publicly-owned treatment works (POTWS) for disposal, however, are exempt from new (RCRA) requirements. Silver-containing solutions that pass through electrolytic, chemical replacement, or ion exchange silver recovery units located on your premises are similarly exempt. However, if you send your wastes off-site for recycling (i.e., silver recovery or solvent recovery) the wastes must be accompanied by a Manifest.

If your business produces 220 pounds or more of hazardous waste per month, you are required to use a Uniform Hazardous Waste Manifest when you ship such wastes off your premises. Item 11 on the Manifest requires the Department of Transportation (DOT) shipping description: the proper DOT shipping name, hazard class, and UN/NA identification number. This information is provided in Table 2. If you do not find your waste listed here, but suspect it may be hazardous, please contact your state hazardous waste management agency for additional assistance.

See Tables 1 and 2 (result)

Table 1

HAZARDOUS WASTES GENERATED BY VARIOUS PRINTING OPERATIONS

TYPICAL PROCESS/ OPERATION	TYPICAL MATERIALS USED	TYPICAL MATERIAL INGREDIENTS	GENERAL WASTE TYPES
PLATE PREPARATION			
*Counter-etch to remove oxide	Phosphoric acid	Phosphoric acid	Acid/alkaline waste
*Deep-etch coating of plates	Deep etch bath	Ammonium dichromate, ammonium hydroxide	Acid/alkaline waste, heavy metals, waste etch bath
*Etch baths	Multimetal plate and plate coating	Ferric chloride (copper), aluminum/zinc chloride/hydrochloric acid (chromium), nitric acid (zinc, magnesium), gum arabic	Waste etch bath, acid/alkaline waste, heavy metal wastes
Apply light sensitive coating	Resins, binders, emulsion, photosensitizers, gelatin, photoemulsions	PVA/ammonium dichromate, polyvinyl cinnamate, fish glue/albumin, silver halide/gelatin emulsion, gum arabic/ammonium dichromate	Photographic waste
Develop plates	Developer	Lactic acid, zinc chloride, magnesium chloride, hydroquinone	Photographic waste
Wash/clean plates, type, die, press blankets and rollers	Alcohols, solvents	Ethyl alcohol, benzene, toluene, xylene, isopropyl alcohol, methyl ethyl ketone, trichloroethylene, perchloroethylene, carbon tetrachloride, gasoline, naphtha, kerosene	Spent solvents
*Apply lacquer	Resins, solvents, vinyl lacquer, lacquer developers	PVC, PVA, maleic acid, methyl ethyl ketone, cyclohexanone, isophorone	Spent solvents
Using ink (lithography, letterpress, screen printing, flexography)	Pigments, dyes, varnish, driers, extenders, modified fountain solutions	Titanium oxide, iron blues, molybdated chrome orange, phthalocyanine pigments, oils, hydrocarbon solvents, waxes, cobalt/zinc/manganese oleates, plasticizers, barium-based pigments	Waste ink with solvents/chromium/lead/barium, ink sludges with chromium/lead/barium
Making gravure cylinders	Acid plating bath	Copper, chromic acid, chrome	Spent plating waste
STENCIL PREPARATION FOR SCREEN PRINTING			
Lacquer stencil film	Solvents, polyester film, vinyl film, dyes	Aliphatic acetates, cellulose-based lacquer, plasticizers	Spent solvents
Photographic stencil film	Organic acids, gelatin (pigmented), polyester film base	Acids, alkalis, peroxide-forming compounds, plasticizers, surfactants	Hydrogen peroxide
Photoemulsion	Resins, binders, photosensitizers, dyes	PVA, PVAC, ammonium or potassium bichromate, diazonium compounds	Photographic waste
Blockout (screen filler)	Pigmented polymers, solvents, acetates	Methylene chloride, methanol, methyl cellulose acetates	Spent solvents

*Older technologies

Table 2 notes:

*These descriptions may change given variations in waste characteristics and conditions.
†Trade names will differ among manufacturers. Check Material Safety Data Sheets for the presence of the following chemicals.
‡The difference between the combustible and flammable liquid hazard class designations is based on the flash point of the material (flammable 0-100°F, combustible 100-200°F). The flash point will depend in large part on the solvents in the waste.
§Not Otherwise Specified.

Table 2

WASTE DESCRIPTIONS[1]				
WASTE TYPE	DESIGNATION[2] TRADE NAMES[3]	DOT SHIPPING NAME	HAZARD CLASS	UN NA ID NUMBER
PHOTOGRAPHIC WASTES				
Heavy Metal Solutions	Photographic processing waste containing heavy metals	Hazardous Waste Solution containing Cadmium, Chromium, Lead, and/or Cyanide	ORM-E	NA9189
Trichloroethylene	Trichloroethylene, Trichloroethene, Ethinyl trichloride, Tri-Clene, Trielene, Tri	Waste Trichloroethylene	ORM-A	UN1710
SPENT SOLVENTS				
Carbon Tetrachloride	Carbon tetrachloride, Perchloromethane, Necatorina, Benzinoform, CCl_4	Waste Carbon Tetrachloride	ORM-A	UN1846
Ethanol	Ethanol, Ethyl alcohol	Waste Ethyl Alcohol	Flammable Liquid	UN1170
Isopropanol	Isopropanol, Isopropyl alcohol	Waste Isopropanol	Flammable Liquid	UN1219
Ethyl Benzene	Ethyl benzene	Waste Ethyl Benzene	Flammable Liquid	UN1175
1,1,1-Trichloroethane	1,1,1-Trichloroethane, Aerothane TT, Chloren, Inhibisol, Trichloroethane, Chlorothen NU, NCI-C04626, Methylchloroform, Chlorothene VG, Chloroethane NU, Chloroxene	Waste 1,1,1-Trichloroethane	ORM-A	UN2831
Methylene Chloride	Dichloromethane, Methane dichloride, Methylene bichloride, NCI-C50102, Methylene dichloride, Solaesthin, Aerothene NM, Narkosil, Solmethine	Waste Dichloromethane or Methylene Chloride	ORM-A	UN1593
WASTE INK WITH SOLVENTS OR HEAVY METALS				
Waste Ink	Various Constituent Solvents, Carbon tetrachloride, Chloroform, Methylene chloride, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Benzene, Toluene, Ethyl benzene, Tetrachloroethylene, Trichloroethylene Various Constituents from Pigments: Chromium, Copper, Lead, Zinc, Cyanide, Aluminum, Cadmium, Nickel, Cobalt	Waste Ink	Combustible Liquid[4] Flammable Liquid	UN2367 UN1210
STRONG ACID/ALKALINE WASTES				
Ammonium hydroxide	Ammonium hydroxide, Aqua Ammonia, Spirit of Hartshorn, NH_4OH	Waste Ammonium Hydroxide (containing not less than 12%, but not more than 44% ammonia	Corrosive Material	NA2672
		(containing less than 12% ammonia)	ORM-A	NA2672
Hydrochloric Acid	Hydrochloric acid, Muriatic acid, HCl	Waste Hydrochloric Acid Mixture	Corrosive Material	NA1789
Nitric Acid	Nitric acid, Aquafortis, HNO_3	Waste Nitric Acid (over 40%)	Oxidizer	UN2031
		(40% or less)	Corrosive Material	NA1760
Phosphoric Acid	Phosphoric acid, Orthophosphoric acid, H_3PO_4	Waste Phosphoric Acid	Corrosive Material	UN1805
Sodium Hydroxide	Sodium hydroxide, Caustic Soda, Soda Lye, Sodium hydrate, NaOH	Waste Sodium Hydroxide Solution	Corrosive Material	UN1824
		Dry Solid, Flake, Bead, or Granular	Corrosive Material	UN1823
Sulfuric Acid	Sulfuric acid, Oil of Vitriol, H_2SO_4	Waste Sulfuric Acid, Spent	Corrosive Material	UN1832
Chromic Acid	Chromic acid	Waste Chromic Acid Solution	Corrosive Material	UN1755
SPENT PLATING WASTES				
Spent Plating Wastes	Spent etch baths, spent plating solutions and sludges, stripping and cleaning baths	Hazardous Waste, Liquid or Solid, NOS[5]	ORM-E	NA9189
INK SLUDGE WITH CHROMIUM OR LEAD				
Ink sludge with Chromium or Lead	Ink sludge containing heavy metals	Hazardous Waste, Liquid or Solid, NOS	ORM-E	NA9189
IGNITABLE WASTES NOS				
Ignitable Wastes NOS	Ignitable Wastes NOS	Waste Flammable Liquid, NOS	Flammable Liquid	UN1993
		Waste Combustible Liquid, NOS	Combustible Liquid	(UN1993)
		Waste Flammable Solid, NOS	Flammable Solid	UN1325